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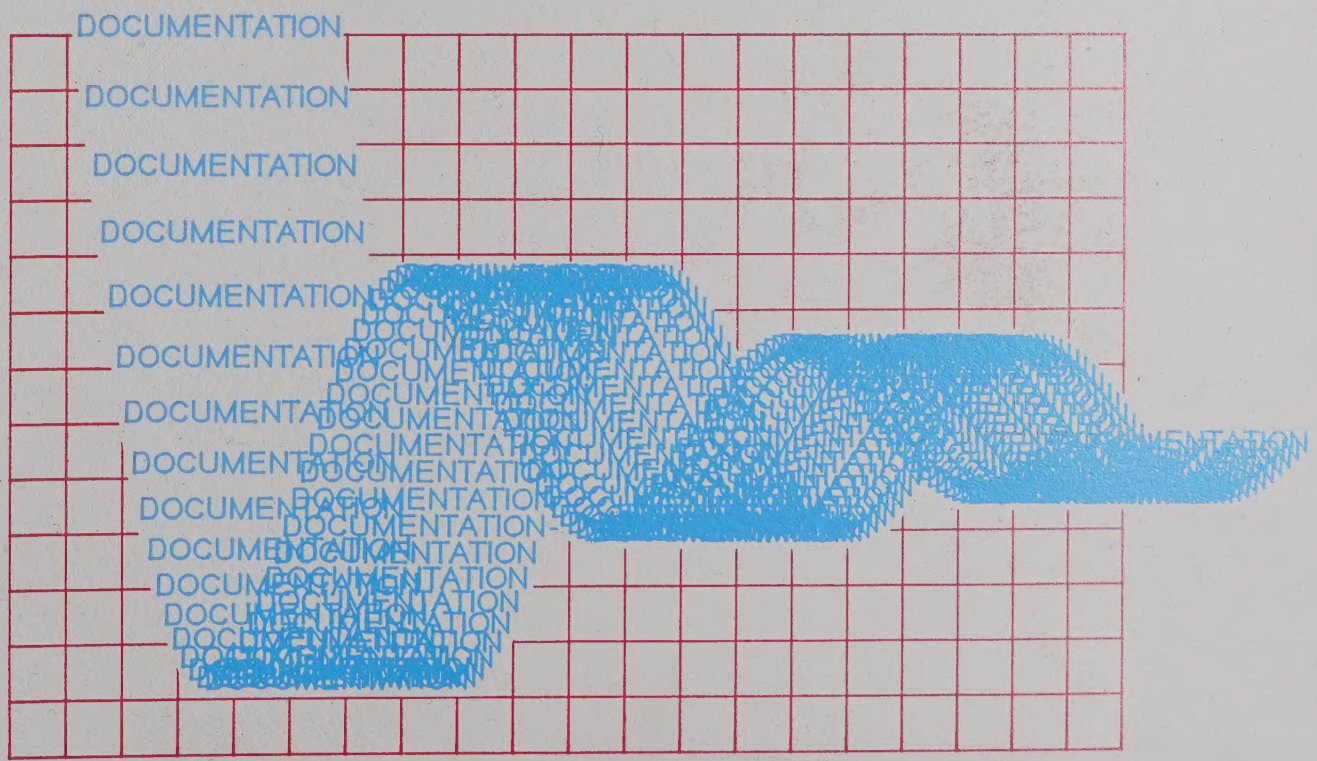

ROHDE&SCHWARZ

Test and Measurement
Division

Software Manual

EDGE Mobile Tests

Application Firmware Extension

FSE-K20

1106.4086.02

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Supplement to Manual FSE-K20/21

For GSM BTS ANALYZER mode and GSM MS ANALYZER mode, there are demodulation problems (message "sync not found") in firmware V1.95 / V2.10 with the following settings:

Digital Standard: GSM 1800 or GSM 1900

Modulation: EDGE

Therefore measurements for EDGE can not be performed for GSM 1800 and GSM 1900.

For standards P-GSM 900, E-GSM 900 and R-GSM 900 or for all standards with modulation GMSK, these problems do not occur.

Workaround: Select GSM 900 as standard and set frequency manually to the GSM 1800 or GSM 1900 band.
Please note following restrictions:
- Modulation Spectrum measurement is only available for band ARFCN ± 1.8MHz.
- Spurious measurement is not available.

A bug fix will be available at beginning of February 2001.

Contents

1 General Information on Application Firmware FSE-K20, EDGE (8PSK) Measurements 1-1

A Brief Explanation of GSM/EDGE 1-1

Firmware Application FSE-K20 1-5

Installing the FS-K20 Firmware Application 1-6

Starting the Application 1-6

Default Settings of the Application 1-6

Measuring with the Application 1-6

Aborting a Measurement 1-7

Results of Measurements 1-7

Exiting the Application 1-8

Trigger Options 1-9

Trigger and Time References 1-9

Possible Errors and Difficulties During the Measurement 1-10

2 Measurements with the Application Firmware FSE-K20 2-1

Introduction 2-1

Menu Overview 2-2

Switching On the FSE-K20 (EDGE Modes) 2-4

Setting the Transmitter Output Power of the MS to be Measured 2-5

Selecting the Midamble 2-6

Selecting and Editing the Limit Lines 2-7

Measurement of Modulation Accuracy with 8PSK Signals 2-10

Additional Hints 2-15

3 Description of Commands 3-1

Table of Softkeys with IEC/IEEE Comman Assigment 3-6

CONFIGURATION Key Group 3-8

4 Index 4-1

Figures

Fig. 1-1 Data transmission in GSM network - T&FDMA communication 1-2

Fig. 2-1 Conversion of user-defined limit lines 2-8

Fig. 2-2 Measurement of modulation accuracy 2-14

Tables

Table 1-1 Downlink – base station transmitting to mobile 1-3

Table 1-2 Uplink - mobile transmitting to base station 1-3

Table 1-3 Results of measurements 1-7

1 General Information on Application Firmware FSE-K20, EDGE (8PSK) Measurements

The FSE-K20 is an extension to FSE-K10.
This extension enables the measurement of 8-PSK-modulated EDGE signals according to the standards.
The full range of functions of the FSE-K10 is thus also available for EDGE signals.

A Brief Explanation of GSM/EDGE

The GSM standard (Global System for Mobile communication) describes the GSM mobile radio network that is in widespread use today. As an extension to this network, 8PSK has been defined as a new mode of modulation in addition to the existing mode of modulation GMSK. The mode of the mobile or base station based thereupon is called EDGE (Enhanced Data rates for GSM Evolution).

The term GSM thus combines two different modes: GMSK and EDGE. In the following, the term EDGE will be used only if there are significant differences between the two modes. In all other cases, the term GSM will be used.

There are two different standards, distinguished primarily by their frequency bands: ETSI (for GSM900, GSM1800) and J-STD-007 (PCS 1900 , primarily in the USA).

The physical layer – the layer of the GSM network on which modulation, transmission of RF signals, reception of RF signals, and demodulation take place – is defined in the standards

- GSM 05.04 Modulation
- GSM 05.05 (ETS 300 910) General measurement specifications and limit values
- GSM 11.10 (ETS 300 607-1) Detailed measurement specifications and limit values for mobiles
- GSM 11.21 (ETS 300 609-1) and Detailed measurement specifications and limit values for base stations
- J-STD 007 Detailed measurement specifications and limit values for mobiles and base stations in the 1900-MHz band

As technological development progresses, J-STD 007 is now being integrated into the other GSM standards.

A T&FDMA method is used to transfer data in the GSM network. This means that the digital information is transmitted discretely in the time domain as well as in the frequency domain.

The time domain is divided logically into frames of different length, the smallest unit being known as a timeslot. A multiframe consists of 26 frames, and a frame has 8 timeslots (see GSM 05.01 for details).

A mobile, therefore, does not communicate continuously with the base station; instead, it communicates discretely in individual timeslots. In the simplest case, 8 mobiles share the 8 timeslots of a frame (TDMA - Time Division Multiple Access).

The frequency domain is divided into frequency bands, and each band, in turn, is subdivided into channels.

Each frequency channel is identified by its center frequency and a number, known as the ARFCN, which is a non-band-specific identifier (ARFCN - absolute radio frequency channel number). A bandwidth of 200 kHz is defined for each frequency channel.

Communication between a mobile and the base station can be either frequency-continuous or frequency-discrete – distributed across various frequency channels (FDMA – Frequency Division Multiple Access). In the standards, the abbreviation "SFH" (slow frequency hopping) is used to designate this mode of communication.

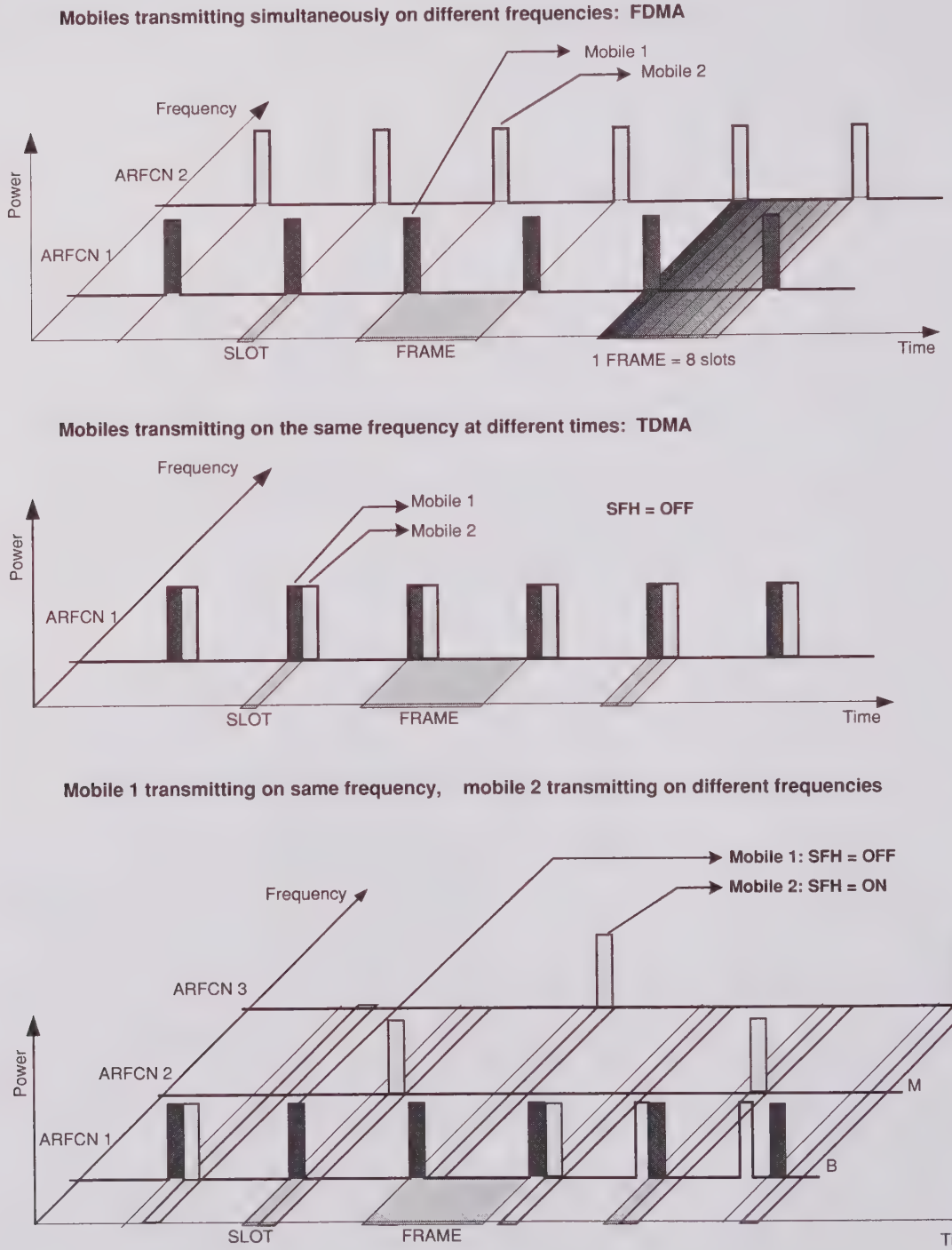


Fig. 1-1 Data transmission in GSM network - T&FDMA communication

Base station and mobile communicate in different frequency ranges. The mobile sends in the “uplink“ and the base station in the "downlink“.

The frequencies specified in the standards plus their channel numbers are listed in the tables below.

Table 1-1 Downlink – base station transmitting to mobile

P-GSM 900	935.2MHz					959.8MHz	FREQ
	1					124	ARFCN
E-GSM 900	925.2MHz	934.8	935	935.2		959.8MHz	FREQ
	975	1023	0	1		124	ARFCN
R-GSM 900	921.2MHz	934.8	935	935.2		959.8MHz	FREQ
	955	1023	0	1		124	ARFCN
DCS 1800	1805.2MHz					1879.8MHz	FREQ
	512					885	ARFCN
PCS 1900	1930.2MHz					1989.8MHz	FREQ
	512					810	ARFCN

Table 1-2 Uplink - mobile transmitting to base station

P-GSM 900	890.2MHz					914.8MHz	FREQ
	1					124	ARFCN
E-GSM 900	880.2MHz	889.8	890	890.2		914.8MHz	FREQ
	975	1023	0	1		124	ARFCN
R-GSM 900	876.2MHz	889.8	890	890.2		914.8MHz	FREQ
	955	1023	0	1		124	ARFCN
DCS 1800	1710.2MHz					1784.8MHz	FREQ
	512					885	ARFCN
PCS 1900	1850.2MHz					1909.8MHz	FREQ
	512					810	ARFCN

At this time, two different modes of modulation are used in the GSM mobile radio network. The original GMSK method has now been joined by an 8PSK method (EDGE).

The GMSK symbol rate is 1/T = 1625/6 ksymb/s (in other words, approx. 270.833 ksymb/s). This corresponds to 1625/6 kbit/s (in other words approx. 270.833 kbit/s). In this method, a bit change represents a symbol. The details are laid down in ETSI standard GSM 05.04.

The 8PSK (EDGE) symbol rate is 1/T = 1625/6 ksymb/s (in other words, approx. 270.833 ksymb/s). This corresponds to 3 x 1625/6 kbit/s (in other words approx. 812.5 kbit/s).
In this method, three bits represent a symbol. The details are laid down in ETSI standard GSM 05.04.

In both cases, however, the channel bandwidth is restricted to 200 kHz. As these figures show, the EDGE bit rate is approx. three times higher than that of the GMSK method.

The increasing demand for more bandwidth is the reason for the constant development of the GSM standard, as evidenced by the recent introduction of the EDGE specification and the GPRS and HSCSD modes.

So far, each mobile has been able to use only one timeslot per frame, but the new HSCSD and GPRS methods will allow permanent assignment of more than one timeslot per mobile, plus dynamic utilisation of multiple timeslots.

The concept behind GPRS (General Packet Radio Service) is dynamic assignment of up to 8 timeslots to each mobile for data transmission, depending on demand (and availability in the network). Again both modes of modulation (GMSK and 8PSK) can be used.

HSCSD (High Speed Circuit Switched Data) allows permanent assignment of up to 4 timeslots to a mobile. Again both modes of modulation (GMSK and 8PSK) can be used.

Of significance for the FSE-K20 application firmware in this respect is that the mobile can send power on a frequency in more than one timeslot.

Firmware Application FSE-K20

The characteristics of the EDGE systems as outlined above have to be measured in development and production and checked against limit values. The characteristics belonging to the physical layer that have to be checked include:

The characteristics of 8PSK modulation:	Modulation accuracy
Carrier power versus time:	Power, time characteristic of power and timing offset of power within a timeslot are checked.
The spectral characteristics:	The spectral distribution of the energy is measured in the frequency channel, in the transmit band and outside the transmit band. A distinction is made between two causes for the form of spectral distribution: 1) The spectrum caused by GMSK or 8PSK (EDGE) modulation (measurement is performed only in that part of the timeslot in which power is virtually constant, in other words the switching ramps are ignored). 2) The spectrum caused by switching of the power in a timeslot.

In accordance with these requirements, the standards define the six measurements supported in this firmware application.

The FS-K20 application provides a convenient means of performing the measurements listed below for GSM900 (P-GSM, E-GSM and R-GSM), DCS1800 or PCS1900 mobiles (by analogy with the standards GSM05.05, GSM 11.10, GSM 11.10-DCS, GSM11.10-1 and J-STD-007 Air Interface):

Characteristics of 8PSK modulation:

- MAC Modulation Accuracy — Measurement of EVM of 95:th-percentile value, of origin offset suppression and frequency error with synchronization to midamble

Carrier power versus time

- CPW Carrier Power — Measurement of carrier power with synchronization to midamble
- PVT Power versus Time — Measurement of carrier power versus time with synchronization to midamble

Spectral characteristics

- MOD Spectrum due to Modulation — Measurement of spectrum due to modulation
- TRA Spectrum due to Transients — Measurement of spectrum due to transients
- SPU Spurious Emissions — Measurement of spurious emissions

The limit values predefined in the standards are automatically set on selection of the standard and can be changed or supplemented.
Extra limit values can be specified for each measurement.

The sections below contain basic information on the main procedures, settings and messages of the device. The descriptions of the measurements in Chapter 2 contain more detailed information specific to the various modes of measurement. The background information in the sections entitled "Additional information" in Chapter 2 is supplementary in nature and not necessary for normal operation. This information merely explains in more detail the internal settings and procedures. Chapter 3 describes the remote-control commands of the application. The relevant commands also accompany each description of a softkey.

Installing the FS-K20 Firmware Application

When shipped ex works, the FS-K20 firmware application is preinstalled and enabled and can be used right away.

When shipped separately, the FSE-K20 firmware application is accompanied by the latest version of the instructions for installation and enabling.

The installation of the FSE-K20 assumes that a firmware version ≥ 1.95/2.10 and Option FSE-K10 have been installed.

Starting the Application

The Application FSE-K20 is an extension to the FSE-K10. Based on the K10, it supports the measurement of EDGE signals. Within the K10, the SETTINGS menu permits to change the mode of modulation to EDGE in the right-hand side menu. Thus, the operating mode EDGE and all limit values and test procedures are preselected according to the standard.

Default Settings of the Application

The basic settings of the parameters required for the measurement are done in the *SETTINGS* menu as with the K2.

For a detailed menu description refer to the FSE-K10 manual.

Measuring with the Application

The measurement procedures as well as the operation are identical to those of the FSE-K10.
As to the range of functions offered, the FSE-K20 differs in that the measurement of the modulation accuracy is performed instead of the phase-frequency-error measurement.

The FSE-K20 also permits to perform reference measurements for correct level setting (to avoid out-of-range values) and for automatic or manual selection of limit lines according to the standard.

Aborting a Measurement

The FSE-K20 provides the same functions as the FSE-K10.

Results of Measurements

Table 1-3 Results of measurements

Measurement	Single value	Limit Line	Table
MAC	EVM peak value EVM RMS value origin offset suppression values 95:th percentile values Frequency error	none	Instantaneous value, Max Hold value, average value, limit value, status of each single value

All other measurements provide the same results as with the FSE-K10.

Exiting the Application

You can exit the application FSE-K20 by calling another operating mode using the Mode key. The functions offered are the same as with the FSE-K10.

Trigger Options

The trigger options are identical to those offered by the FSE-K10.

Trigger and Time References

The trigger and time references of the FSE-K20 are identical to those of the FSE-K10.

Possible Errors and Difficulties During the Measurement

The three main sources of error in GSM measurement are described below:

- **No carrier signal**

Causes:	Wrong working frequency (ARFCN), slow frequency hopping active, test line defective or wrong attenuation, wrong reference level	
Effects:	Reference measurement:	Inadequate power is measured (e.g. average measurement with slow frequency hopping), measurement issues warning. Sweep stops (measurements with midamble synchronization), warning message: Sync not found / Burst not found Sweep stops (measurements with RF Power trigger)
	Main measurement:	Sweep stops with midamble synchronization active (PFE, CPW, PVT) or RF Power trigger in use. Sweep resumes when signal is restored.
Remedy:	- Set correct frequency - Deactivate slow frequency hopping (see "Measurements with Slow Frequency Hopping" in the descriptions of the individual measurements) or switch on SFH in the secondary menu of a measurement (only with TRA and SPU) - Set correct external attenuation (*SETTINGS\EXTERNAL ATTEN)* - Set correct reference level (*SETTINGS \POWER SETTINGS ...*)	

- **No trigger**

Effects:	All triggered measurements:sweep stops. This can be seen from the fact that the trigger LED is not illuminated and does not flash either.
Remedy:	- Change trigger - RF Power trigger: reduce external attenuation increase signal level

- **Burst not found/Sync not found**

Causes:	Dummy burst, slow frequency hopping active, wrong midamble
Effects:	Sweep stops (measurements with midamble synchronization)
Remedy:	Necessary only if measurement does not run, otherwise measurement is possible - Check the midamble - Deactivate slow frequency hopping

2 Measurements with the Application Firmware FSE-K20

Introduction

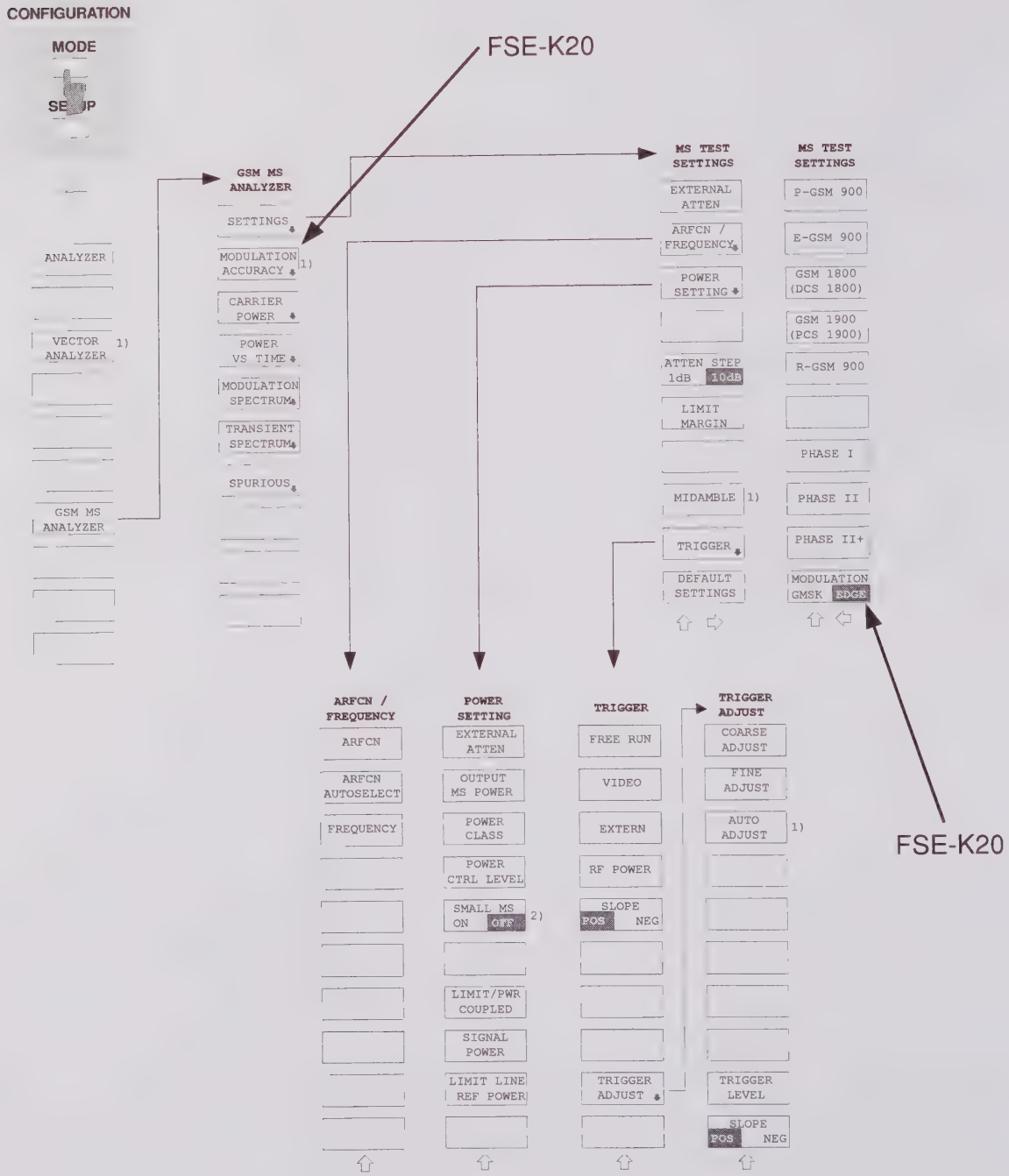
This section describes the specific differences between the FSE-K20 and the FSE-K10 as to their basic functions. The measurements, settings, menus and procedures not mentioned here are identical to those of the FSE-K10 and described in the FSE-K10 manual.

The following measurements are possible using the application FSE-K20:

- MAC Modulation Accuracy — Measurement of EVM, 95:th percentile, origin offset suppression and frequency error with midamble synchronization
- CPW Carrier Power — Measurement of carrier power with midamble synchronization
- PVT Power versus Time — Measurement of carrier power versus time with midamble synchronization
- MOD Modulation Spectrum — Measurement of modulation spectrum
- TRA Transient Spectrum — Measurement of transient spectrum
- SPU Spurious Emissions — Measurement of spurious emissions

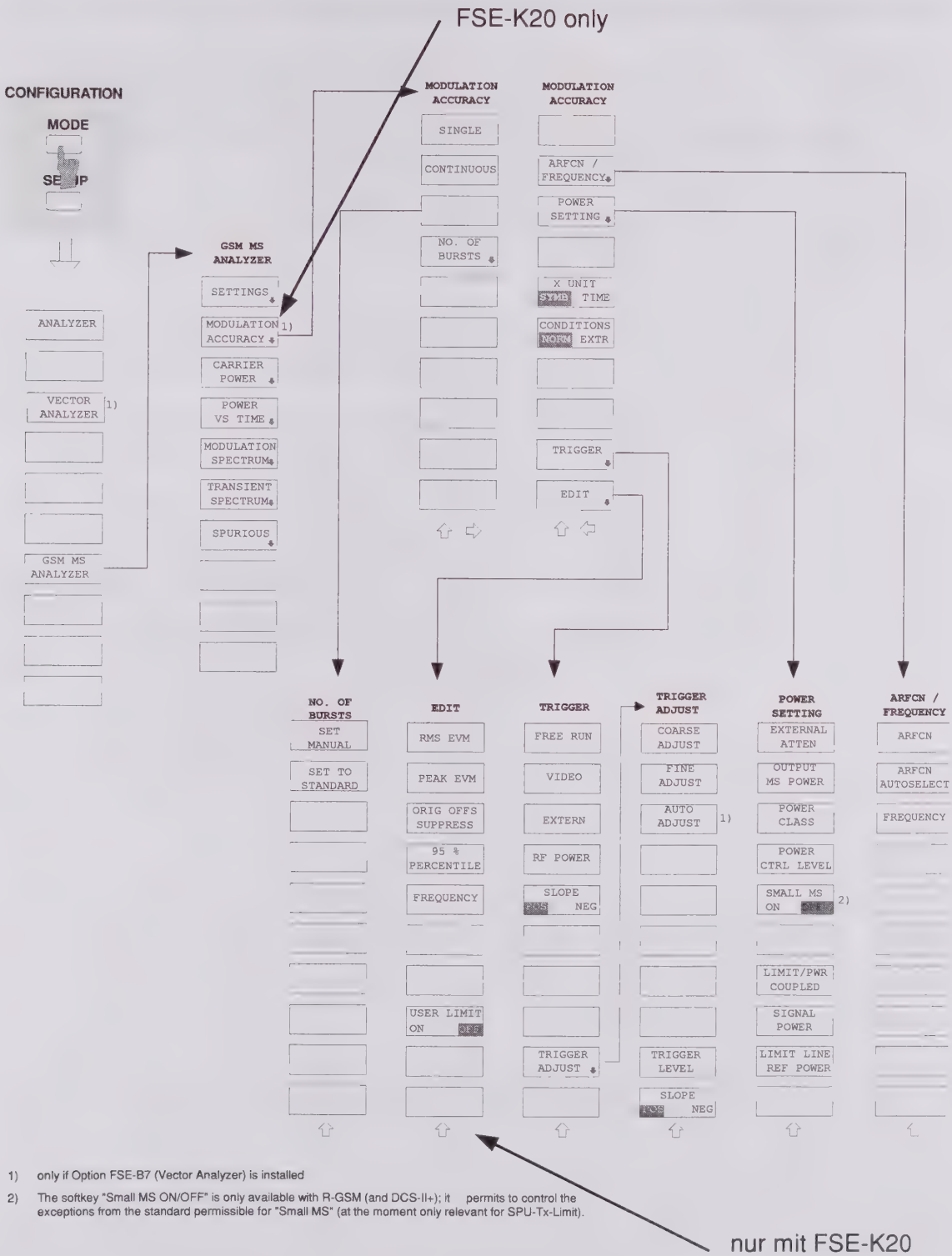
Operation of the FSE-K20 is only possible if the FSE-K10 is installed.

Menu Overview



1) only if Option FSE-B7 (Vector Analyzer) is installed

2) The softkey "Small MS ON/OFF" is only available with R-GSM (and DCS-II+); it permits to control the exceptions from the standard permissible for "Small MS" (at the moment only relevant for SPU-Tx-Limit).



1) only if Option FSE-B7 (Vector Analyzer) is installed

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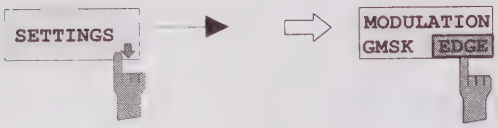
All other menus are identical to those of the FSE-K10.

Switching On the FSE-K20 (EDGE Modes)

The *SETTINGS* softkey calls the submenu for changing the mode of modulation and predefining the test parameters. The associated side menu permits to select the transmission system. The parameters to be changed more often like channel, power, midamble etc. are to be found in the main part of the submenu to allow for easy access.



The MODULATION GMSK/EDGE softkey switches the mode of modulation between GMSK and EDGE (8-PSK).

When the standard and the mode of modulation are selected, the FSE/FSIQ uses the settings and limit values specified for the standard for each measurement.

In particular, it is taken into account that in the case of the MAC, CPW, PVT and MOD measurement, the limit values differ depending on the mode of modulation.

For the standards P-GSM 900/Phase 1 the measurement is made to GSM11.10, for DCS 1800 Phase 1 to ETSI standard ETS 300 020-3 (GSM 11.10-DCS), for P-GSM 900 and DCS 1800 (Phase 2 each) as well as for E-GSM 900 to ETSI standard ETS 300 607-1(GSM 11.10-1) and for the standard PCS 1900 to US standard STD-007 Air Interface. For Phase II+ (in the case of R-GSM and EDGE) the measurement is also made to standards GSM 05.05 and 11.10-1.

Switchover of the phases is identical to that in the FSE-K10. The softkey is disabled for Phase I.

IEC-bus command: `CONF:MTYP EDGE`

Setting the Transmitter Output Power of the MS to be Measured

The transmitter output power is set as described for the FSE-K10.
When EDGE is switched on, only power classes E1, E2 and E3 are offered.

GSM 400 & GSM 900 transmitter output power for different power classes 8PSK Modulated Signals

			Power control level	Transmitter output power	Tolerances	
E1	E2	E3				
·			5	33	±2 dB	±2.5dB
			6	31	±3 dB	±4 dB
			7	29	±3 dB	±4 dB
	·		8	27	±3 dB	±4 dB
	·		9	25	±3 dB	±4 dB
	·	·	10	23	±3 dB	±4 dB
	·	·	11	21	±3 dB	±4 dB
	·	·	12	19	±3 dB	±4 dB
	·	·	13	17	±3 dB	±4 dB
	·	·	14	15	±3 dB	±4 dB
	·	·	15	13	±3 dB	±4 dB
	·	·	16	11	±5 dB	±6 dB
	·	·	17	9	±5 dB	±6 dB
	·	·	18	7	±5 dB	±6 dB
	·	·	19	5	±5 dB	±6 dB

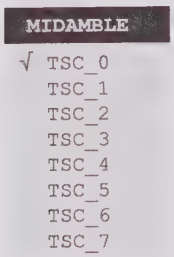
DCS1800 and PCS1900 transmitter output power for different power classes 8-PSK Modulated Signals

Power class			Power control level	Transmitter output power	Tolerances	
E1	E2	E3			NORMAL	EXTREME
·			0	30	±3 dB	±4dB
			1	28	±3 dB	±4 dB
	·		2	26	±3 dB	±4 dB
	·		3	24	±3 dB	±4 dB
	·	·	4	22	±3 dB	±4 dB
	·	·	5	20	±3 dB	±4 dB
	·	·	6	18	±3 dB	±4 dB
	·	·	7	16	±3 dB	±4 dB
	·	·	8	14	±4 dB	±4 dB
	·	·	9	12	±4 dB	±5 dB
	·	·	10	10	±4 dB	±5 dB
	·	·	11	8	±4 dB	±5 dB
	·	·	12	6	±4 dB	±5 dB
	·	·	13	4	±5 dB	±5 dB
	·	·	14	2	±5 dB	±6 dB

Selecting the Midamble

The *MIDAMBLE* softkey opens a table where the EDGE midamble used by the mobile can be selected. The midamble is required for determination of the time reference only if the Option Vector Signal Analysis FSE-B7 is installed. If the option is not installed, the softkey is disabled.

The softkey opens a table which offers all available EDGE midambles for selection.



TSC_0 to TSC_7 (Training Sequence Code) represent the training sequences for the normal burst.

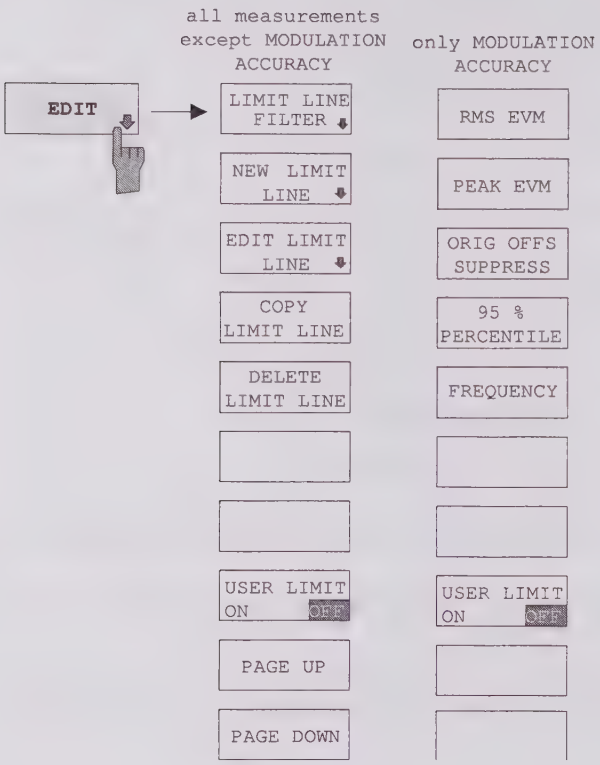
The desired midamble can be selected using the cursor keys or the rotary knob and activated using one of the unit keys. The selected midamble is marked by a tick.

IEC-bus command: `CONF[:MS]:CHAN:TSC 0...7`
`CONF[:MS]:CHAN:TSC:AUTO ON | OFF`

EDGE midambles:

TSC0	001001 111001001111	001111111111	001001001001	111001001001	111001001111	001111111111
TSC1	001001 111001111111	001111111111	001111111111	111001001001	111001111111	001111111111
TSC2	001111 001001001001	111111111001	111111111001	111001001111	001001001001	111111111001
TSC3	001111 001001001111	111111111001	111111001111	001001001111	001001001111	111111111001
TSC4	001001 001111111001	111001111111	111001001111	001001001001	001111111001	111001111111
TSC5	001111 001001111111	111001111001	111111001001	001001001111	001001111111	111001111001
TSC6	111001 111001001111	111111111111	001111111001	001001111001	111001001111	111111111111
TSC7	111111 111001111111	111111001001	001111001001	111001111111	111001111111	111111001001

Selecting and Editing the Limit Lines



The EDIT softkey opens a submenu for definition and activation of specific limit lines.

The limit lines are edited via the limit-line editor (a function of the basic instrument).

For the modulation accuracy measurement, only the values for RMS EVM, PEAK EVM, ORIG OFFSET SUPPRESSION, 95:th PERCENTILE and FREQUENCY are entered instead of limit lines. Extra softkeys are provided for this purpose.

All the limit lines of the EDGE software FSE-K20 form an integral part of it and are available when the option is enabled. The line names are indicated at the line itself.

To be able to edit the available limit lines, they must be copied from the CD-ROM supplied with the Option FSE-K10 to the device (see supplement to CD-ROM).

A few characteristics of the limit lines of the GSM option cannot be changed manually. These include the exceptions and clipping lines or sockets defined in the standards (... whichever is the highest ...).

These special characteristics are only available in the GSM software.

In the case of limit lines in the time domain, the center of the screen is assigned to the time 0. For defining limit values to the left of the center of the screen negative time values must therefore be entered.

If oblique limit lines are defined by the user, they will be converted into steps in List mode for the measurements Spurious, Spurious Sgl Step, Modulation and Transient as shown by the following illustration:

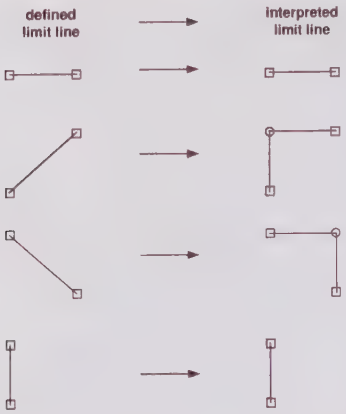


Fig. 2-1 Conversion of user-defined limit lines

The *RMS EVM* softkey is only provided in the menu for modulation accuracy measurement.

It opens a window in which the limit value for the maximum permissible RMS PEAK value can be entered in percent.

The value entered is indicated in the evaluation table of the modulation accuracy measurement in the LIMIT column when the user-specific limit lines are switched on (*USER LIMIT ON*).

IEC-bus command: `:CONF<1|2>[:MS]:LIMit:EVMR`

The *PEAK EVM* softkey is only provided in the menu for modulation accuracy measurement.

It opens a window where the limit line for the maximum permissible EVM PEAK value can be entered in percent.

The value entered is indicated in the evaluation table of the modulation accuracy measurement in the LIMIT column when the user-specific limit values are switched on (*USER LIMIT ON*).

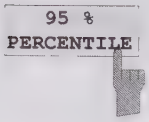
IEC-bus command: `:CONF<1|2>[:MS]:LIMit:EVMP`

The *ORIG OFFS SUPPRESS* softkey is only provided in the menu for modulation accuracy measurement.

It opens a window where the limit value for the maximum permissible ORIGIN OFFSET SUPPRESSION value can be entered in dB.

The value entered is indicated in the evaluation table of the modulation accuracy measurement in the LIMIT column when the user-specific limit values are switched on (*USER LIMIT ON*).

IEC-bus command: `:CONF<1|2>[:MS]:LIM:OSUP`



The *95 % PERCENTILE* softkey is only provided in the menu for modulation accuracy measurement.

It opens a window where the limit value for the maximum permissible 95:th percentile value can be entered in percent.

The value entered is indicated in the evaluation table of the modulation accuracy measurement in the LIMIT column when the user-specific limit values are switched on (*USER LIMIT ON*).

IEC-bus command: `:CONF<1|2>[:MS]:LIM:PERC`

The *FREQUENCY* softkey is only provided in the menu for modulation accuracy measurement.

It opens a window where the limit value for the permissible frequency error (determined over 142 useful symbols) can be entered in ppm.

The value entered is indicated in the evaluation table of the modulation accuracy measurement in the LIMIT column when the user-specific limit values are switched on (*USER LIMIT ON*).

IEC-bus command: `:CONF<1|2>[:MS]:LIM:FREQ`

All other functions of this menu are identical to those of the FSE-K10.

Measurement of Modulation Accuracy with 8PSK Signals

Note: *Measurement of the modulation accuracy of 8PSK-modulated signals is only possible if the Option FSE-B7 is installed. Otherwise, the softkey will not be offered.*

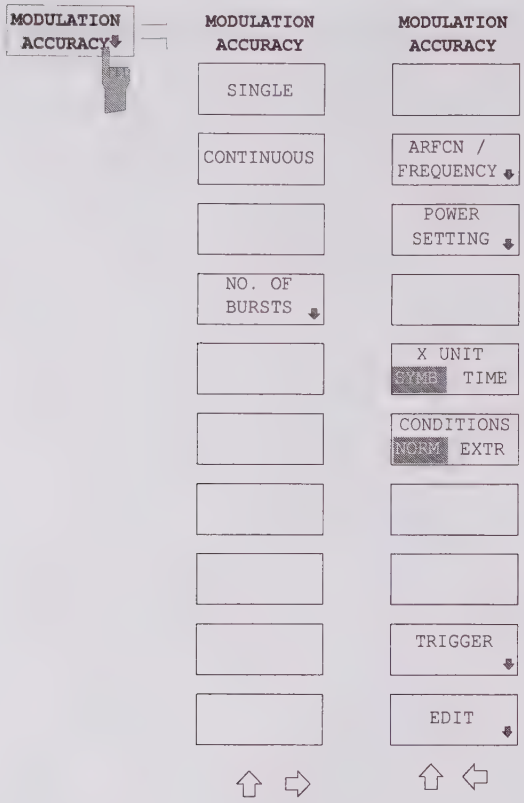
The modulation accuracy of 8PSK-modulated signals is indicated by the magnitude of the error vector (EVM error vector magnitude).
The error vector EVM is the magnitude of the error vector that connects the measured I and Q value at the complex layer with the ideal I and Q value at the decision points.

The measurement is performed to GSM 05.05 and GSM 11.10, the EVM of each of the 142 specified symbols of a normal burst being determined individually, indicated and compared with the limit values. The RMS value and the peak value of the EVM are evaluated.

The origin offset suppression or the IQ offset are indicated as a measure of carrier suppression. This value is indicated in dB according to the standard.

The 95:th percentile value is a statistical value that indicates the number of EVM values lying below a particular EVM limit value.

The frequency error is calculated from the phase position of the symbols according to the standard and displayed as well.



The *MODULATION ACCURACY* softkey opens a submenu for configuration of the measurement of the 8-PSK modulation accuracy according to the selected standard.

The right-hand side menu of this submenu permits to do the main settings – without the need for changing into the *SETTINGS* menu.

Besides, the limit values used can be changed in this submenu (*EDIT* softkey). The settings made using the *EDIT* softkey are local in the respective measurement.

After termination of (and during) the measurement, measuring window A provides a summary of the numerical modulation errors. The error calculation is performed over the 147 useful symbols without tail bits (i.e. over 142 symbols).

- Instantaneous value, Max Hold value and average value of EVM peak value
- Instantaneous value, Max Hold value and average value of EVM RMS value
- Instantaneous value, Max Hold value and average value of origin offset suppression value
- Instantaneous value, Max Hold value and average value of 95:th percentile value
- Max Hold value and average value of frequency error

Measuring window B indicates the EVM versus time, i.e. over the 147 useful symbols of the normal burst. In addition, the range of the 142 symbols is marked by two markers. 3 traces are used for the display:

- Trace No. 1:Clear Write
- Trace No. 2: Max Hold
- Trace No. 3: Min Hold.

The midamble selected in the *SETTING* menu is used for synchronization. For the measurement on DUTs that transmit no midamble refer to the hints below the softkey *NO. OF BURSTS*.

In addition to the values required according to the standard, the value *TRIG TO SYNC START* is displayed. This is the time that passes from the trigger to the first bit of the first symbol of the midamble.

IEC-bus command:

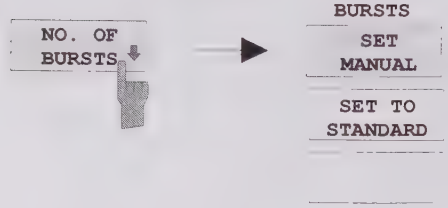
```
:CONF<1|2>:BURS:MACC[:IMM]
```

The *SINGLE* softkey triggers a single measurement over the number of bursts entered.

IEC-bus `:INIT<1|2>:CONT OFF; :INIT<1|2>[:IMM]`
command: `:READ:BURS:MACC:RMS:STAT`
`:READ:BURS:MACC:RMS:AVER`
`:READ:BURS:MACC:RMS:MAX`
`:READ:BURS:MACC:PEAK:STAT`
`:READ:BURS:MACC:PEAK:AVER`
`:READ:BURS:MACC:PEAK:MAX`
`:READ:BURS:MACC:OSUP:STAT`
`:READ:BURS:MACC:OSUP:AVER`
`:READ:BURS:MACC:OSUP:MAX`
`:READ:BURS:MACC:PERC:STAT`
`:READ:BURS:MACC:PERC:AVER`
`:READ:BURS:MACC:PERC:MAX`
`:READ:BURS:MACC:FREQ:STAT`
`:READ:BURS:MACC:FREQ:AVER`
`:READ:BURS:MACC:FREQ:MAX`

The *CONTINUOUS* softkey starts a measurement that is not interrupted until another measuring function is called.

IEC-bus: `:INIT<1|2>:CONT ON; :INIT<1|2>[:IMM]`
command: `:FETC:BURS:MACC:RMS:STAT`
`:FETC:BURS:MACC:RMS:AVER`
`:FETC:BURS:MACC:RMS:MAX`
`:FETC:BURS:MACC:PEAK:STAT`
`:FETC:BURS:MACC:PEAK:AVER`
`:FETC:BURS:MACC:PEAK:MAX`
`:FETC:BURS:MACC:OSUP:STAT`
`:FETC:BURS:MACC:OSUP:AVER`
`:FETC:BURS:MACC:OSUP:MAX`
`:FETC:BURS:MACC:PERC:STAT`
`:FETC:BURS:MACC:PERC:AVER`
`:FETC:BURS:MACC:PERC:MAX`
`:FETC:BURS:MACC:FREQ:STAT`
`:FETC:BURS:MACC:FREQ:AVER`
`:FETC:BURS:MACC:FREQ:MAX`



The *NO. OF BURSTS* softkey calls a submenu that permits to determine the number of bursts to be taken into account in the measurement.

The *SET MANUAL* softkey permits to set a user-specific number of bursts.
Default setting is 1 burst.

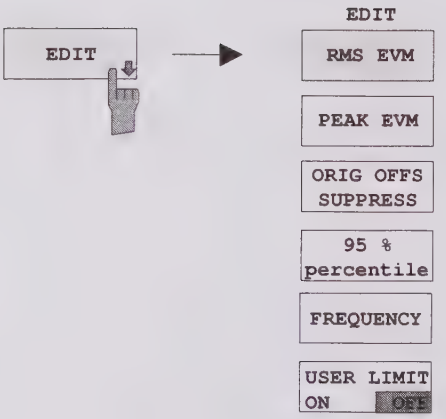
IEC-bus command: `:CONF:BURS:MACC:COUN`

The *SET TO STANDARD* softkey permits to set the number of bursts to the value specified for the currently selected standard.
`This is 200 for all standards for the modulation accuracy measurement.`

Caution: *With NO OF BURST =1, 142 symbols are always measured and the result displayed in the table after the trigger event has occurred (taking into account the delay set under TRIGGER ADJUST).*

Even measurements for which no midamble or no burst could be found are thus taken into account.

With NO OF BURST>1, errors are determined in those bursts only in which the midamble has been detected correctly.



The *EDIT* softkey opens a submenu which permits to specify the limit values to be used in the measurement.

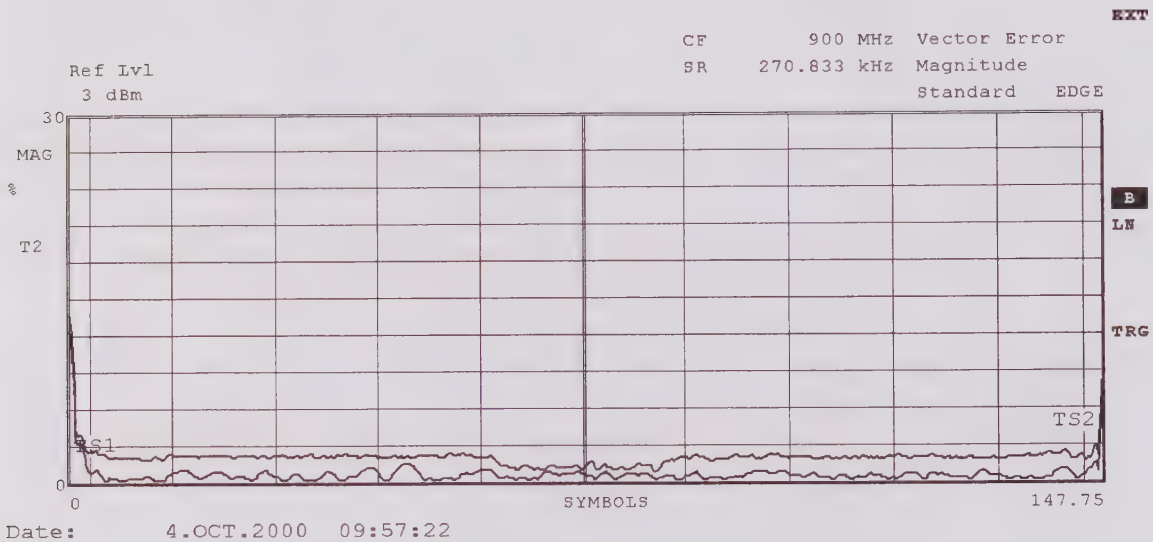
In the input window, the limit values for measurement of the modulation accuracy can be changed via the numeric keypad or the rotary knob of the FSE/FSIQ. The frequency error is entered in "ppm" (parts per million).

IEC-bus command:

Modulation Accuracy

ARFCN: 50 Status: PASSED
Frequency: 900.00000 MHz
Carrier Power: 0.00 dBm Trg to Sync Start: 265.5 µs
Ext. Att/Gain: 0.00 dB
No. of Bursts: 20

ERRORS	CURRENT	MAX HOLD	AVG	LIMIT	STATUS
RMS EVM	0.53 %	0.89 %	0.61 %	9.00 %	PASSED
PEAK EVM	1.42 %	2.37 %	1.58 %	30.00 %	PASSED
OO SUPPR	46.03 dB	43.40 dB	45.81 dB	30.00 dB	PASSED
95% PERC	2.14 %	2.14 %	2.14 %	15.00 %	PASSED
FREQ	193.72 mHz	-3.29 Hz	-881.07 mHz	± 45.00 Hz 0.05 ppm	PASSED



Date: 4.OCT.2000 09:57:22

Fig. 2-2 Measurement of modulation accuracy

Additional Hints

Abbreviations used:	SigPwr	(Expected) signal power, predefined by the current settings for power class and power level.
	F(ARFCN)	Working frequency, determined by frequency setting
	ExtAtt	External attenuation
	NOB	Number Of Bursts – value for the number of sweeps set by the user
Reference measurement:		None
Main measurement:		Split Screen, trace at bottom, result display at top; vector mode (i.e.: IQ mode). SingleSweep, ZeroSpan; Center = F(ARFCN); Result: Max. and average EVM Origin offset suppression 95:th percentile as well as max. frequency error incl. limit values. Trace: EVM versus burst
	InpAtt	Auto Low Noise (at least –20 dBm at mixer)
	RefLvl	3.0 + SigPwr
	Display:	Y-Unit PERCENT, 3 %/Div X-Unit SYMBOLS, 148 FullScale Display lines for restriction of the range to be measured with 3 and 145 symbols,
	VA-Settings:	Memory Size 2048 ResultLength 148 FrameLength 300 Points/Symbol 4 SyncOffset 61 Find Sync/Burst ON/ON Meas only if sync'd OFF/ON NoOfBursts=1/ NoOfBursts>1
	Trace 1:	MAX/HOLD
	Trace 2:	Result display
	Trace 3:	CLEAR/WRITE
	Trace 4:	MIN/HOLD
	Triggerdelay:	-100 µs
	NOB	200

Limits:

RMS EVM	9%
PEAK EVM	30%
ORIGIN OFFSET SUPPR.	30dB
95% percentile	15%
Frequency error (rel.)	0.10ppm

3 Description of Commands

CONFigure[:MS]:MTYPe GMSK | EDGE

This command selects the standard (GMSK or EDGE).

Example: "CONF:MTYP EDGE"

Features: *RST value: GMSK
SCPI: device-specific

Mode: MS

CONFigure:BURSt:MACCuracy:COUNt 1 to 1000

This command sets the number of bursts used for the determination of average and maximum value.

Example: "CONF:BURS:MACC:COUN 100"

Features: *RST value: 500 (GSM/DCS1800 Phase I)
200 otherwise
SCPI: device-specific

Modes: BTS, MS

It is available only in conjunction with option GSM BTS Analyzer FSE-K11 or option GSM MS Analyzer, FSE-K10, and Vector Signal Analysis, FSE-B7.

CONFigure:BURSt:MACCuracy:CONDition NORMal | EXTReme

This command defines the conditions for modulation accuracy measurement.

Example: ":CONF:BURS:MACC:COND EXTR"

Features: *RST value: NORMal
SCPI: device-specific

Modes: BTS, MS

CONFigure:BURSt:POWer[:IMMediate]

This command selects measurement of the average carrier power of the base station or mobile.

Example: "CONF:BURS:POW"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

This command is an event and thus has no query and no *RST value assigned.

CONFigure[:MS]:LIMit:FREQuency <numeric_value>

This command determines the frequency error limits in ppm for the phase/frequency measurement.

Example: ":CONF:LIM:FREQ 36"

Feature: *RST value: depending on standard
SCPI: device-specific

Mode: MS

CONFigure[:MS]:LIMit:EVMRms<numeric_value>

This command determines the value in percent for the error limits of error vector magnitude measurement with RMS weighting.

Example: "CONF:LIM:EVMR 40"

Features: *RST value depending on the standard
SCPI: device-specific

Mode: MS

CONFigure[:MS]:LIMit:EVMPeak<numeric_value>

This command determines the value in percent for the error limits of error vector magnitude measurement with PEAK weighting.

Example: "CONF:LIM:EVMP 30"

Features: *RST value depending on the standard
SCPI: device-specific

Mode: MS

CONFigure[:MS]:LIMit:OSUPpress<numeric_value>

This command defines the limit for the origin offset suppression.

Example: "CONF:LIM:OSUP 30"

Features: *RST value depending on the standard
SCPI: device-specific

Mode: MS

CONFigure[:MS]:LIMit:PERCentile<numeric_value>

This command determines the 95% percentile limits. The percentile defines the value which the EVM may exceed 5% of all symbols at maximum.

Example: "CONF:LIM:PERC 30"

Features: *RST value depending on the standard
SCPI: device-specific

Mode: MS

FETCh:BURSt:MACCuracy:RMS:STATus?

This command reads out the status of the RMS measurement of the modulation accuracy taken over the selected number of bursts.

0: failed, 1: passed

Example: "FETC:BURS:MACC:RMS:STAT?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

FETCh:BURSt:MACCuracy:RMS:AVERage?

This command reads out the average of the RMS measurement of the modulation accuracy taken over the selected number of bursts.

Example: "FETC:BURS:MACC:RMS:AVER?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

FETCh:BURSt:MACCuracy:RMS:MAXimum?

This command reads out the maximum of the RMS measurement of the modulation accuracy taken over the selected number of bursts.

Example: "FETC:BURS:MACC:RMS:MAX?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

FETCh:BURSt:MACCuracy:PEAK:STATus?

This command reads out the status of the PEAK measurement of the modulation accuracy taken over the selected number of bursts.

0: failed, 1: passed

Example: "FETC:BURS:MACC:PEAK:STAT?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see `CONFigure:BURSt:MACCuracy`).

FETCh:BURSt:MACCuracy:PEAK:AVERage?

This command reads out the average of the PEAK measurement of the modulation accuracy taken over the selected number of bursts.

Example: `"FETC:BURS:MACC:PEAK:AVER?"`

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see `CONFigure:BURSt:MACCuracy`).

FETCh:BURSt:MACCuracy:PEAK:MAXimum?

This command reads out the maximum of the PEAK measurement of the modulation accuracy taken over the selected number of bursts.

Example: `"FETC:BURS:MACC:PEAK:MAX?"`

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see `CONFigure:BURSt:MACCuracy`).

FETCh:BURSt:MACCuracy:OSUPpress:STATus?

This command reads out the status of the original offset supression measurement of the modulation accuracy taken over the selected number of bursts.

0: failed, 1: passed

Example: `"FETC:BURS:MACC:OSUP:STAT?"`

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see `CONFigure:BURSt:MACCuracy`).

FETCh:BURSt:MACCuracy:OSUPpress:AVERage?

This command reads out the average of the original offset supression measurement of the modulation accuracy taken over the selected number of bursts.

Example: "FETC:BURS:MACC:OSUP:AVER?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

FETCh:BURSt:MACCuracy:OSUPpress:MAXimum?

This command reads out the maximum of the original offset supression measurement of the modulation accuracy taken over the selected number of bursts.

Example: "FETC:BURS:MACC:OSUP:MAX?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

FETCh:BURSt:MACCuracy:PERCentile:STATus?

This command reads out the status of the 95% percentile measurement of the modulation accuracy taken over the selected number of bursts.

0: failed, 1: passed

Example: "FETC:BURS:MACC:PERC:STAT?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

FETCh:BURSt:MACCuracy:PERCentile:AVERage?

This command reads out the average of the 95% percentile measurement of the modulation accuracy taken over the selected number of bursts.

Example: "FETC:BURS:MACC:PERC:AVER?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

FETCh:BURSt:MACCuracy:PERCentile:MAXimum?

This command reads out the maximum of the 95% percentile measurement of the modulation accuracy taken over the selected number of bursts.

Example: "FETC:BURS:MACC:PERC:MAX?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

FETCh:BURSt:MACCuracy:FREQuency:STATus?

This command reads out the status of the frequency error measurement of the modulation accuracy taken over the selected number of bursts.

0: failed, 1: passed

Example: "FETC:BURS:MACC:FREQ:STAT?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

FETCh:BURSt:MACCuracy:FREQuency:AVERage?

This command reads out the average of the frequency error measurement of the modulation accuracy taken over the selected number of bursts.

Example: "FETC:BURS:MACC:FREQ:AVER?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

FETCh:BURSt:MACCuracy:FREQuency:MAXimum?

This command reads out the maximum of the frequency error measurement of the modulation accuracy taken over the selected number of bursts.

Example: "FETC:BURS:MACC:FREQ:MAX?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:RMS:STATus?

This command reads out the status of the RMS measurement of the modulation accuracy taken over the selected number of bursts.

0: failed, 1: passed

Example: "FETC:BURS:MACC:RMS:STAT?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:RMS:AVERage?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the average of the RMS-measurement taken over the selected number of bursts.

Example: ":READ:BURS:MACC:RMS:AVER?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:RMS:MAXimum?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the maximum of the RMS-measurement for the selected number of bursts.

Example: ":READ:BURS:MACC:RMS:MAX?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:PEAK:STATus?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the status of the PEAK-measurement taken over the selected number of bursts.

0: failed, 1: passed

Example: ":READ:BURS:MACC:PEAK:STAT?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:PEAK:AVERage?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the average of the PEAK-measurement taken over the selected number of bursts.

Example: ":READ:BURS:MACC:PEAK:AVER?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:PEAK:MAXimum?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the maximum of the PEAK-measurement for the selected number of bursts.

Example: ":READ:BURS:MACC:PEAK:MAX?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

:READ:BURSt:MACCuracy:OSUPpress:STATus?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the status of the original offset suppression measurement taken over the selected number of bursts.

0: failed, 1: passed

Example: ":READ:BURS:MACC:OSUP:STAT?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:OSUPpress:AVERage?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the average of the original offset suppression measurement taken over the selected number of bursts.

Example: ":READ:BURS:MACC:OSUP:AVER?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:OSUPpress:MAXimum?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the maximum of the original offset suppression measurement for the selected number of bursts.

Example: ":READ:BURS:MACC:OSUP:MAX?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:PERCentile:STATus?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the status of the 95% percentile measurement taken over the selected number of bursts.

0: failed, 1: passed

Example: ":READ:BURS:MACC:PERC:STAT?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:PERCentile:AVERage?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the average of the 95% percentile measurement taken over the selected number of bursts.

Example: ":READ:BURS:MACC:PERC:AVER?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:PERCentile:MAXimum?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the maximum of the 95% percentile measurement for the selected number of bursts.

Example: ":READ:BURS:MACC:PERC:MAX?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:FREQuency:STATus?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the status of the frequency error measurement taken over the selected number of bursts.

0: failed, 1: passed

Example: ":READ:BURS:MACC:FREQ:STAT?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:FREQuency:AVERage?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the average of the frequency error measurement taken over the selected number of bursts.

Example: ":READ:BURS:MACC:FREQ:AVER?"

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command ABORt. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see :CONFigure:BURSt:MACCuracy).

READ:BURSt:MACCuracy:FREQuency:MAXimum?

This command starts the measurement of the modulation accuracy of the base station or mobile and reads out the maximum of the frequency error measurement for the selected number of bursts.

Example: `":READ:BURS:MACC:FREQ:MAX?"`

Features: *RST value: --
SCPI: device-specific

Modes: BTS, MS

When the measurement is started the instrument automatically assumes the SINGLE mode.

An ongoing measurement can be aborted via the command `ABORt`. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the `:FETCh:BURSt`-subsystem.

This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the modulation accuracy is selected (see `:CONFigure:BURSt:MACCuracy`).

Table of Softkeys with IEC/IEEE Comman Assigment

MODULATION GMSK EDGE

:CONFigure<1|2>[:MS]:MTYPe GMSK | EDGE

POWER SETTINGS

--

OUTPUT MS POWER

:CONFigure<1|2>[:MS]:POWer:EXPected <num_value> | EG1 | EG2| EG3
EG1, EG1, EG3 nur bei EDGE mit Option K20

MODULATION ACCURACY

:CONFigure<1|2>:BURSt:MACCuracy[:IMMediate]
only Option K20

SINGLE

:INITiate<1|2>:CONTinuous OFF; :INITiate<1|2>[:IMMediate]
:READ:BURSt:MACCuracy:RMS:STATus
:READ:BURSt:MACCuracy:RMS:AVERage
:READ:BURSt:MACCuracy:RMS:MAXimum
:READ:BURSt:MACCuracy:PEAK:STATus
:READ:BURSt:MACCuracy:PEAK:AVERage
:READ:BURSt:MACCuracy:PEAK:MAXimum
:READ:BURSt:MACCuracy:OSUPpress:STATus
:READ:BURSt:MACCuracy:OSUPpress:AVERage
:READ:BURSt:MACCuracy:OSUPpress:MAXimum
:READ:BURSt:MACCuracy:PERCentile:STATus
:READ:BURSt:MACCuracy:PERCentile:AVERage
:READ:BURSt:MACCuracy:PERCentile:MAXimum
:READ:BURSt:MACCuracy:FREQuency:STATus
:READ:BURSt:MACCuracy:FREQuency:AVERage
:READ:BURSt:MACCuracy:FREQuency:MAXimum

CONTINUOUS

:INITiate<1|2>:CONTinuous ON; :INITiate<1|2>[:IMMediate]
:FETCh:BURSt:MACCuracy:RMS:STATus
:FETCh:BURSt:MACCuracy:RMS:AVERage
:FETCh:BURSt:MACCuracy:RMS:MAXimum
:FETCh:BURSt:MACCuracy:PEAK:STATus
:FETCh:BURSt:MACCuracy:PEAK:AVERage
:FETCh:BURSt:MACCuracy:PEAK:MAXimum
:FETCh:BURSt:MACCuracy:OSUPpress:STATus
:FETCh:BURSt:MACCuracy:OSUPpress:AVERage
:FETCh:BURSt:MACCuracy:OSUPpress:MAXimum
:FETCh:BURSt:MACCuracy:PERCentile:STATus
:FETCh:BURSt:MACCuracy:PERCentile:AVERage
:FETCh:BURSt:MACCuracy:PERCentile:MAXimum
:FETCh:BURSt:MACCuracy:FREQuency:STATus
:FETCh:BURSt:MACCuracy:FREQuency:AVERage
:FETCh:BURSt:MACCuracy:FREQuency:MAXimum

NO. OF BURSTS

SET MANUAL

:CONFigure<1|2>:BURSt:MACCuracy:COUNt <num_value>

SET TO STANDARD

--

ARFCN / FREQUENCY

s. sub menu SETTINGS

POWER SETTINGS	s. sub menu SETTINGS
X UNIT SYMB TIME	:CALCulate<1|2>::X:UNIT:TIME S|SYM
CONDITIONS NORM EXTR	:CONFigure<1|2>:BURSt:MACCuracy:CONDitions NORMal | EXTReme
TRIGGER	s. sub menu SETTINGS
EDIT	--
RMS EVM	:CONFigure<1|2>[:MS]:LIMit:EVMRms <num_value>
PEAK EVM	:CONFigure<1|2>[:MS]:LIMit:EVMPeak <num_value>
ORIG OFFS SUPPRESS	:CONFigure<1|2>[:MS]:LIMit:OSUPpress <num_value>
95% PERCENTILE	:CONFigure<1|2>[:MS]:LIMit:PERCentile <num_value>
FREQUENCY	:CONFigure<1|2>[:MS]:LIMit:FREQuency <num_value>
USER LIMIT ON OFF	:CONFigure<1|2>[:MS]:LIMit:STANdard ON | OFF

CONFIGURATION Key Group

MODE	
GSM MS ANALYZER	:INSTrument<1|2>[:SELect] MGSM
SETTINGS	--
EXTERNAL ATTEN	:[SENSe<1|2>:]CORRection:LOSS:INPut[:MAGNitude] <num_value>
ARFCN / FREQUENCY	--
ARFCN	:CONFigure<1|2>[:MS]:ARFCn <num_value>
ARFCN AUTOSELECT	:CONFigure<1|2>[:MS]:ARFCn:AUTO ONCE
FREQUENCY	:[SENSe<1|2>:]FREQuency:CENTer <num_value>
POWER SETTINGS	--
EXTERNAL ATTEN	:[SENSe<1|2>:]CORRection:LOSS:INPut[:MAGNitude] <num_value>
OUTPUT MS POWER	:CONFigure<1|2>[:MS]:POWer:EXPected <num_value> | EG1 | EG2| EG3 EG1, EG1, EG3 nur bei EDGE mit Option K13
POWER CLASS	:CONFigure<1|2>[:MS]:POWer:CLASs <num_value>
POWER CTRL LEVEL	:CONFigure<1|2>[:MS]:POWer:LEVel <num_value>
SMALL MS ON OFF	:CONFigure<1|2>[:MS]:POWer:SMALl ON | OFF
SMALL MS ON OFF	:CONFigure<1|2>[:MS]:POWer:SMALl ON | OFF
LIMIT/PWR COUPLED	:CONFigure<1|2>[:MS]:POWer:COUPled ON | OFF
SIGNAL POWER	:CONFigure<1|2>[:MS]:POWer:EXPected <num_value>
LIMIT LINE REF POWER	:CONFigure<1|2>[:MS]:POWer:LIMit <num_value>
LIMIT MARGIN	:CALCulate<1|2>:LIMit:MARGin <num_value>
MIDAMBLE	:CONFigure<1|2>[:MS]:CHANnel:TSC 0...7

TRIGGER	--
FREE RUN	:TRIGger<1|2>[:SEQuence]:SOURceIMMediate
VIDEO	:TRIGger<1|2>[:SEQuence]:SOURce VIDeo
EXTERN	:TRIGger<1|2>[:SEQuence]:SOURceEXTernal :TRIGger<1|2>[:SEQuence]:LEVel[:EXTernal] -5.0...+5.0V
RF POWER	:TRIGger<1|2>[:SEQuence]:SOURce RFPower
SLOPE POS NEG	:TRIGger<1|2>[:SEQuence]:SLOPe POSitive|NEGative
TRIGGER ADJUST	--
COARSE ADJUST	:TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:SLOT <num_value>
FINE ADJUST	:TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:SLOT <num_value>
AUTO ADJUST	:TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:SLOT:AUTO ONCE
TRIGGER LEVEL	:TRIGger<1|2>[:SEQuence]:LEVel[:EXTernal] <num_value>
SLOPE POS NEG	:TRIGger<1|2>[:SEQuence]:SLOPe POSitive|NEGative
DEFAULT SETTINGS	:CONFigure<1|2>[:MS]:PRESet
P-GSM 900	:CONFigure<1|2>[:MS]:NETWork[:TYPE] PGSM | PGSM900
E-GSM 900	:CONFigure<1|2>[:MS]:NETWork[:TYPE] EGSM | EGSM900
GSM 1800 (DCS 1800)	:CONFigure<1|2>[:MS]:NETWork[:TYPE] DCS | GSM1800
GSM 1900 (PCS 1900)	:CONFigure<1|2>[:MS]:NETWork[:TYPE] PCS | GSM1900
R-GSM 900	:CONFigure<1|2>[:MS]:NETWork[:TYPE] RGSM | RGSM900
PHASE I	:CONFigure<1|2>[:MS]:NETWork:PHASe 1
PHASE II	:CONFigure<1|2>[:MS]:NETWork:PHASe 2
PHASE II+	:CONFigure<1|2>[:MS]:NETWork:PHASe 2,PLUS

MODULATION GMSK EDGE	:CONFigure<1|2>[:MS]:MTYPe GMSK | EDGE only Option K20
PHASE/FREQ ERROR	:CONFigure<1|2>:BURSt:PFERror[:IMMediate]
SINGLE	:INITiate<1|2>:CONTinuous OFF; :INITiate<1|2>[:IMMediate]
CONTINUOUS	:INITiate<1|2>:CONTinuous ON; :INITiate<1|2>[:IMMediate]
NO. OF BURSTS	
SET MANUAL	:CONFigure<1|2>:BURSt:PFERror:COUNt <num_value>
SET TO STANDARD	--
ARFCN / FREQUENCY	s. sub menu SETTINGS
POWER SETTINGS	s. sub menu SETTINGS
X UNIT SYMB TIME	:CALCulate<1|2>::X:UNIT:TIME S|SYM
CONDITIONS NORM EXTR	:CONFigure<1|2>:BURSt:PFERror:CONDitions NORMal | EXTReme
TRIGGER	s. sub menu SETTINGS
EDIT	--
PHASE PEAK	:CONFigure<1|2>[:MS]:LIMit:PPEak <num_value>
PHASE RMS	:CONFigure<1|2>[:MS]:LIMit:PRMS <num_value>
FREQUENCY	:CONFigure<1|2>[:MS]:LIMit:FREQuency <num_value>
USER LIMIT ON OFF	:CONFigure<1|2>[:MS]:LIMit:STANdard ON | OFF
MODULATION ACCURACY	:CONFigure<1|2>:BURSt:MACCuracy[:IMMediate] only Option K20

SINGLE	:INITiate<1|2>:CONTinuous OFF; :INITiate<1|2>[:IMMediate] :READ:BURSt:MACCuracy:RMS:STATus :READ:BURSt:MACCuracy:RMS:AVERage :READ:BURSt:MACCuracy:RMS:MAXimum :READ:BURSt:MACCuracy:PEAK:STATus :READ:BURSt:MACCuracy:PEAK:AVERage :READ:BURSt:MACCuracy:PEAK:MAXimum :READ:BURSt:MACCuracy:OSUPpress:STATus :READ:BURSt:MACCuracy:OSUPpress:AVERage :READ:BURSt:MACCuracy:OSUPpress:MAXimum :READ:BURSt:MACCuracy:PERCentile:STATus :READ:BURSt:MACCuracy:PERCentile:AVERage :READ:BURSt:MACCuracy:PERCentile:MAXimum :READ:BURSt:MACCuracy:FREQuency:STATus :READ:BURSt:MACCuracy:FREQuency:AVERage :READ:BURSt:MACCuracy:FREQuency:MAXimum
CONTINUOUS	:INITiate<1|2>:CONTinuous ON; :INITiate<1|2>[:IMMediate] :FETCh:BURSt:MACCuracy:RMS:STATus :FETCh:BURSt:MACCuracy:RMS:AVERage :FETCh:BURSt:MACCuracy:RMS:MAXimum :FETCh:BURSt:MACCuracy:PEAK:STATus :FETCh:BURSt:MACCuracy:PEAK:AVERage :FETCh:BURSt:MACCuracy:PEAK:MAXimum :FETCh:BURSt:MACCuracy:OSUPpress:STATus :FETCh:BURSt:MACCuracy:OSUPpress:AVERage :FETCh:BURSt:MACCuracy:OSUPpress:MAXimum :FETCh:BURSt:MACCuracy:PERCentile:STATus :FETCh:BURSt:MACCuracy:PERCentile:AVERage :FETCh:BURSt:MACCuracy:PERCentile:MAXimum :FETCh:BURSt:MACCuracy:FREQuency:STATus :FETCh:BURSt:MACCuracy:FREQuency:AVERage :FETCh:BURSt:MACCuracy:FREQuency:MAXimum
NO. OF BURSTS	
SET MANUAL	:CONFigure<1|2>:BURSt:MACCuracy:COUNt <num_value>
SET TO STANDARD	--
ARFCN / FREQUENCY	s. sub menu SETTINGS
POWER SETTINGS	s. sub menu SETTINGS
X UNIT SYMB TIME	:CALCulate<1|2>::X:UNIT:TIME S|SYM
CONDITIONS NORM EXTR	:CONFigure<1|2>:BURSt:MACCuracy:CONDitions NORMal | EXTReme
TRIGGER	s. sub menu SETTINGS
EDIT	--
RMS EVM	:CONFigure<1|2>[:MS]:LIMit:EVMRms <num_value>

PEAK EVM	:CONFigure<1|2>[:MS]:LIMit:EVMPeak <num_value>
ORIG OFFS SUPPRESS	:CONFigure<1|2>[:MS]:LIMit:OSUPpress <num_value>
95% PERCENTILE	:CONFigure<1|2>[:MS]:LIMit:PERCentile <num_value>
FREQUENCY	:CONFigure<1|2>[:MS]:LIMit:FREQuency <num_value>
USER LIMIT ON OFF	:CONFigure<1|2>[:MS]:LIMit:STANdard ON | OFF
CARRIER POWER	:CONFigure<1|2>:BURSt:POWer[:IMMediate] :CALCulate<1|2>:LIMit:BURSt:POWer?
MEAS MAX OUTPUT PWR	:READ:BURSt:POWer?
INC PWR CTRL LEVEL	:READ:BURSt:POWer:LEVel?
NO. OF BURSTS	--
SET MANUAL	:CONFigure<1|2>:BURSt:POWer:COUNt <num_value>
SET TO STANDARD	--
SGL MEAS ON OFF	:CONFigure<1|2>[:MS]:POWer:SINGle[:STATe] ON | OFF
MEAS SGL PWR LEVEL	:READ:BURSt:POWer?
POWER CTRL LEVEL	:CONFigure<1|2>[:MS]:POWer:LEVel <num_value>
CLEAR SGL RESULT TAB	:CONFigure<1|2>[:MS]:POWer:SINGle:CLEar
SIGNAL POWER	:CONFigure<1|2>[:MS]:POWer:EXPected <num_value>
ARFCN / FREQUENCY	s. sub menu SETTINGS
POWER SETTINGS	s. sub menu SETTINGS
CONDITIONS NORM EXTR	:CONFigure<1|2>:BURSt:POWer:CONDition NORMal | EXTReme
MEAS BANDWIDTH	:[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution] DEF | 300 kHz | 1 MHz
SYNC TO MIDAMBLE	:TRIGger<1|2>[:SEQuence]:SYNChronize:SOURce FRAMe | TSC

TRIGGER	s. sub menu SETTINGS
POWER VS TIME	:CONFigure<1|2>:BURSt:PTEMplate[:IMMediate] :CALCulate<1|2>:LIMit:BURSt:PTEMplate?
SINGLE	:INITiate<1|2>:CONTinuous OFF; :INITiate<1|2>[:IMMediate]
CONTINUOUS	:INITiate<1|2>:CONTinuous ON; :INITiate<1|2>[:IMMediate]
BURST HIGH RESOLUTION	:CONFigure<1|2>:BURSt:PTEMplate:SELect TOP
NO. OF BURSTS	--
SET MANUAL	:CONFigure<1|2>:BURSt:PTEMplate:COUNt <num_value>
SET TO STANDARD	--
FULL BURST	:CONFigure<1|2>:BURSt:PTEMplate:SELect FULL
RISING EDGE	:CONFigure<1|2>:BURSt:PTEMplate:SELect RISing
FALLING EDGE	:CONFigure<1|2>:BURSt:PTEMplate:SELect FALLing
START REF MEAS	:READ:BURst:REFerence[:IMMediate]?
REF MEAS AUTO USER	:CONFigure<1|2>:BURst:REFerence:AUTO ON | OFF
ARFCN / FREQUENCY	s. sub menu SETTINGS
POWER SETTINGS	s. sub menu SETTINGS
X UNIT SYMB TIME	:CALCulate<1|2>:X:UNIT:TIME S|SYM
MEAS BANDWIDTH	:[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution] DEF | 300kHz | 1MHz
SYNC TO MIDAMBLE	:TRIGger<1|2>[:SEQuence]:SYNChronize:SOURce FRAMe | TSC
TRIGGER	s. sub menu SETTINGS
EDIT	--
LIMIT LINE FILTER	--
EDIT LIMIT LINE	s. basic instrument

USER LIMIT ON OFF	:CONFigure<1|2>[:MS]:LIMIt:STANdard ON | OFF
PAGE UP	--
PAGE DOWN	--
MODULATION SPECTRUM	:CONFigure<1|2>:SPECtrum:MODulation[:IMMediate] :CALCulate<1|2>:LIMit:SPECtrum:MODulation? :CALCulate<1|2>:LIMit:SPECtrum:MODulation:FAILs? :CALCulate<1|2>:LIMit:SPECtrum:MODulation:EXCeptions?
SINGLE FREQ SWEEP	:INITiate<1|2>:CONTinuous OFF; :INITiate<1|2>[:IMMediate]
CONTINUOUS FREQ SWEEP	:INITiate<1|2>:CONTinuous ON; :INITiate<1|2>[:IMMediate]
START LIST	:READ:SPECtrum:MODulation[:ALL]?
NO. OF BURSTS	--
SET MANUAL	:CONFigure<1|2>:SPECtrum:MODulation:COUNt <num_value>
SET TO STANDARD	--
ARFCN ± 1.8 MHz	:CONFigure<1|2>:SPECtrum:MODulation:RANGe
TX BAND	:CONFigure<1|2>:SPECtrum:MODulation:RANGe
±1.8 MHZ TX BAND	:CONFigure<1|2>:SPECtrum:MODulation:RANGe
RX BAND GSM 900	:CONFigure<1|2>:SPECtrum:MODulation:RANGe RXBand
RX BAND DCS 1800	:CONFigure<1|2>:SPECtrum:MODulation:RANGe DCSRx1800
RX BAND	:CONFigure<1|2>:SPECtrum:MODulation:RANGe RXBand
ARFCN / FREQUENCY	s. sub menu SETTINGS
POWER SETTINGS	s. sub menu SETTINGS
RX BAND GAIN	:[SENSe<1|2>:]CORRection:RXGain:INPut[:MAGNitude] <num_value>

TRIGGER	s. sub menu SETTINGS
EDIT	--
LIMIT LINE FILTER	--
EDIT LIMIT LINE	s. basic instrument
USER LIMIT ON OFF	:CONFigure<1|2>[:MS]:LIMIt:STANdard ON | OFF
PAGE UP	--
PAGE DOWN	--
TRANSIENT SPECTRUM	:CONFigure<1|2>:SPECtrum:SWITching[:IMMediate] :CALCulate<1|2>:LIMit:SPECtrum:SWITching? :CALCulate<1|2>:LIMit:SPECtrum:SWITching:FAILs?
SINGLE FREQ SWEEP	:INITiate<1|2>:CONTinuous OFF; :INITiate<1|2>[:IMMediate]
CONTINUOUS FREQ SWEEP	:INITiate<1|2>:CONTinuous ON; :INITiate<1|2>[:IMMediate]
START LIST	:READ:SPECtrum:SWITching[:ALL]?
NO. OF BURSTS	--
SET MANUAL	:CONFigure<1|2>:SPECtrum:SWITching:COUNt <num_value>
SET TO STANDARD	--
ARFCN / FREQUENCY	s. sub menu SETTINGS
POWER SETTINGS	s. sub menu SETTINGS
MS SFH ON OFF	:CONFigure<1|2>[:MS]:CHANnel:SFH ON | OFF
MEAS BANDWIDTH	:[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution] DEF | 300 kHz | 1 MHz
TRIGGER	s. sub menu SETTINGS
EDIT	--
LIMIT LINE FILTER	--

EDIT LIMIT LINE	s. basic instrument
USER LIMIT ON OFF	:CONFigure<1|2>[:MS]:LIMIt:STANdard ON | OFF
PAGE UP	--
PAGE DOWN	--
SPURIOUS	:CONFigure<1|2>:SPURious[:IMMediate] :CALCulate<1|2>:LIMit:SPURious? TXBand | OTXBand | IDLeband :CALCulate<1|2>:LIMit:SPURious:FAILs? TXBand | OTXBand | IDLeband
START LIST SGL STEP	ABORT;:READ:SPURious:STEP?
CONT LIST SGL STEP	:READ:SPURious:STEP?
START LIST	:READ:SPURious [:ALL]?
SWEEP COUNT	--
SWP COUNT TX / <>TX	:CONFigure<1|2>:SPURious:COUNt <num_value>
TX BAND	:CONFigure<1|2>:SPURious:RANGe TXBand
<> TX BAND	:CONFigure<1|2>:SPURious:RANGe OTXBand
IDLE MODE	:CONFigure<1|2>:SPURious:RANGe IDLeband
TX BAND ±2.0 MHZ	:CONFigure<1|2>:SPURious:RANGe COMBined
SELECT STEP	:CONFigure<1|2>:SPURious:STEP:COUNT? :CONFigure<1|2>:SPURious:STEP<1..26> ON | OFF
ARFCN / FREQUENCY	s. sub menu SETTINGS
POWER SETTINGS	s. sub menu SETTINGS
MS SFH ON OFF	:CONFigure<1|2>[:MS]:CHANnel:SFH ON | OFF
TX SUPPR ON OFF	:CONFigure<1|2>[:MS]:TXSupp ON | OFF
ANTENNA COND RAD	:CONFigure<1|2>:SPURious:ANTenna CONDucted|RADiated

SWEEPTIME STD AUTO	:CONFigure<1|2>[:MS]:SWEeptime STANdard|AUTO
TRIGGER	s. sub menu SETTINGS
EDIT	--
LIMIT LINE FILTER	--
EDIT LIMIT LINE	s. basic instrument
USER LIMIT ON OFF	:CONFigure<1|2>[:MS]:LIMIt:STANdard ON | OFF
PAGE UP	--
PAGE DOWN	--

4 Index

A

ARFCN 1-1

B

Burst not found 1-10

C

Carrier signal, not detected 1-10

D

Downlink 1-3

E

EDGE 1-4
Enabling 1-6
Exiting the application 1-8

F

FDMA 1-2
Frequency error 2-10

G

GPRS 1-4

H

HSCSD 1-4

I

Installation 1-6

M

Measurements
aborting 1-7
results 1-7

P

Phase/frequency error 2-10

R

Results of measurements 1-7

S

Softkey
CONTINUOUS 2-12
EDIT 2-7
FREQUENCY 2-9
MIDAMBLE 2-6
NO. OF BURSTS 2-13
PHASE PEAK 2-8, 2-9
PHASE/FREQ ERROR 2-11
SET MANUAL 2-13
SET TO STANDARD 2-13
SETTINGS 2-4
SINGLE 2-12
Standard 2-4
standards 1-1
Starting the application 1-6
Sync not found 1-10

T

TDMA 1-1
Test parameter 2-4
Training sequence 2-6
Transmission system 2-4
Trigger
not detected **1-10**
Trigger and Time References 1-9
TSC (Training Sequence Code) 2-6

U

Uplink 1-3